Original Article

Diagnostic Accuracy of Ultrasound in Differentiating Benign and Malignant Breast Masses Taking Histopathology as Gold Standard

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ABSTRACT

Objective: To determine the diagnostic accuracy of ultrasound in differentiating benign and malignant breast masses taking histopathology as gold standard.

Study Design: Cross sectional validation study

Place and Duration of Study: This study was conducted at the Department of Radiology, Lahore General Hospital, Lahore from February 2019 to August 2019.

Materials and Methods: Patients between the ages of 20 to 70 years referred to Radiology department from surgical OPD with history of breast lump. Ultrasound was done in radiology department with high frequency linear probe 7. 5 MHz of Toshiba Xario 200. Findings were noted. FNAC was done and samples were sent for histopathology. The data was analyzed in SPSS v. 21.

Results: The mean age of females was 47.88±11.29 years. There were 121 (66.4%) females belonged to low socioeconomic status, 55 (30.2%) females belonged to middle class while 6 (3.3%) females belonged to high class. In total sample, 147 (80.8%) females were married while 35 (19.2%) were unmarried. There were 79 (43.4%) were nulliparous while 103 (56.6%) had 1 or more children. The mean duration of diagnosis was 12.94±2.36 moths. The mean lump size was 37.84±15.87 mm. In this study, the Sensitivity of ultrasound was 94.1%, specificity was 89.3%, PPV was 77.4%, NPV was 97.5% and diagnostic accuracy was 90.7%.

Conclusion: Thus the ultrasound is accurate enough that it can be applied as first line diagnostic tool for differentiation of malignant breast lesions from benign lesions.

Key Words: Breast Malignancy, Ultrasound, Mammography, Fine Needle Aspiration Cytology, Histopathology

INTRODUCTION

Breast cancer is the most common cancer of females. It is one of the leading cause of morbidity and mortality among females worldwide. According to one study conducted in Iran, 1,671,149 new cases of breast cancer were identified worldwide and it resulted in 521,907 deaths in 2012.[1] One study conducted at Washington showed that breast cancer was responsible for 13.1 million cases of Disability Adjusted Life Years.[2]

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One study from China showed 1.6 million patients are diagnosed with breast cancer each year and about 1.2 million patients die from breast cancer in China.[3,4] Breast cancer is also very prevalent in Pakistan. According to Pink ribbon Campaign Pakistan, it was found that 90,000 new cases were diagnosed each year and it caused about 40,000 deaths each year in Pakistan.[5] According to Karachi cancer registry, breast cancer incidence was found to be 34.6% in 2009.[6]

As breast tumor is very prevalent, so it is very important to diagnose it well in-time for its prompt treatment. There are various modalities available for diagnosis of breast tumor. Physical examination, X-ray mammography, ultrasonography, MRI and FNAC are commonly used diagnostic modalities for breast tumor.[7, 8] Although X-ray mammography is widely used screening tool for breast tumor in developed countries but its usage is limited in developing countries like Pakistan because lack of its availability and trained medical staff. Furthermore, X-ray mammography is less effective in detection of breast cancer in younger age groups as compared to older. Some studies also showed that ultrasonography has ability to detect very small, mammographically occult breast tumors.[9]

Ultrasonography is an indispensable tool in breast imaging and is complementary to both X-ray mammography and magnetic resonance imaging of the breast. Advances in ultrasound technology allow confident characterization of not only benign cysts but also benign and malignant solid masses.[10, 11] Knowledge and understanding of current and emerging ultrasound technology, along with the application of meticulous scanning technique, is imperative for image optimization and diagnosis.[12]

Rationale for this study is that breast cancer is the most common cancer and leading cause of morbidity and mortality. So early detection of this disease is very important for prompt treatment to decrease the burden of disease. Furthermore, results for diagnostic accuracy of ultrasonography for diagnosing breast mass has conflicting result. So a study is needed to determine the sensitivity and specificity of ultrasound for diagnosis benign vs malignant breast mass. It will enable the surgeons to diagnose the disease early and start treatment according to the condition. In addition, this study is being carried out at a large tertiary care hospital to get large sample size and statistically significant results.

MATERIALS AND METHODS

This study was conducted at the Department of Radiology, Lahore General Hospital, Lahore from February 2019 to August 2019.

Sample Size: Sample size was calculated through WHO calculator. Sample size will be 182 is calculated at 95% confidence interval, taking prevalence of breast mass as 34.6%[6], sensitivity as 77% (13% margin of error) and specificity as 96.2% (4% margin of error).

Sampling Technique: Non-probability consecutive sampling.

Inclusion Criteria: Patients between the ages of 20 to 70 years referred to Radiology department of Lahore General Hospital from surgical OPD with history of breast lump.

Exclusion Criteria: The cases with infection over the skin or signs of abscess making FNAC difficult. Documented cases of previous breast surgery. Patients with lung tumor, transitional cell carcinoma or other neoplasia, able to shorten life expectancy, unstable cardiopulmonary, neurological, or psychiatric disease, cases suffering from end organ disease like chronic kidney, heart or liver disease.

Data Collection Procedure: After the acceptance of synopsis from ethical review committee of the hospital 182 cases fulfilled the inclusion and exclusion criteria were included in this study. An informed written consent was taken from all the participants. Particulars of patients like age, duration of illness were taken. Detailed history and examination were performed. Ultrasound was done in Radiology department with high frequency linear probe 7.5 MHz of Toshiba Xario

200. Findings were noted. The cases were assessed for the grey scale findings regarding the shape, size, orientation, margins, echo-pattern, posterior acoustic shadowing and consistency of the lesions to label it as benign, moderate or borderline lesions. Mass was labeled as benign on ultrasonography if mass was homogeneously hypoechoic, well-circumscribed, wider, with smooth lobules and surrounded by echogenic pseudocapsule and was labeled as malignant on ultrasonography if mass washypoechoic, deep, contains angular or irregular borders, microlobulations, calcifications and speculations.

The patient's course of management wasmethodically followed the till the lesion was biopsied and samples were sent to the laboratory. Histopathology was then verified with the report of ultrasound breast. The results were recorded and all the data was collected on the performa.

Patient were labelled to have benign breast mass on histology if there was simple epithelial hyperplasia, non-proliferative fibrocystic changes, early fibroadenosis or calcification present in benign looking duct and were labelled as to have malignant breast carcinoma if there was ductal or lobular hyperplasia with atypia, with cells arranged in clusters or islands, fat necrosis, calcification within the lumen of duct or malignant cells in glandular pattern.

Data Analysis: The data was analyzed in SPSS v. 21.A 2x2 table was constructed to measure the sensitivity, specificity, PPV,NPV, accuracy taking FNAC as gold standard.

RESULTS

The mean age of females was 47.88±11.29years. There were 121 (66.4%) females belonged to low socioeconomic status, 55 (30.2%) females belonged to middle class while 6 (3.3%) females belonged to high class.

Table No.1: Demographics of females

n	182
Age (years)	47.88±11.29
Socioeconomic status	
Low	121 (66.4%)
Middle	55 (30.2%)
High	6 (3.3%)
Marital status	
Married	147 (80.8%)
Unmarried	35 (19.2%)
Parity	
Nulliparous	79 (43.4%)
Multiparous	103 (56.6%)
H/O breast feeding	88 (85.4%, out of 103 parous females)
Duration of mass (months)	12.94±2.36
Lump size(mm)	37.84±15.87

In total sample, 147 (80.8%) females were married while 35 (19.2%) were unmarried. There were 79 (43.4%) were nulliparous while 103 (56.6%) had 1 or more children and among them history of breast feeding was positive in 88 (85.4%) females. The mean duration of diagnosis was 12.94±2.36 moths. The mean lump size was 37.84±15.87mm. Table 1

In this study, the Sensitivity of ultrasound was 94.1%, specificity was 89.3%, PPV was 77.4%, NPV was 97.5% and diagnostic accuracy was 90.7%. Table 2

Table No.2: Accuracy of ultrasound taking FNAC as gold standard

		FNAC / histopathology		Total on ultrasound
		Malignant	Benign	
Ultrasound	Malignant	48	14	62
	Benign	3	117	120
Total on histopathology		51	131	182

Sensitivity: 94.1%, specificity: 89.3%, PPV:77.4%, NPV: 97.5%, diagnostic accuracy: 90.7%

DISCUSSION

To date, mammographic breast density has been classified according to the Breast Imaging-Reporting and Data System (BI-RADS) categories from visual assessment, but this is known to be very subjective. Despite many research reports, the authors believe there has been a lack of physical-led and evidence-based arguments about what breast density actually is, how it should be measured, and how it should be used.[13] Histopathologic patterns and breast cancer biomarkers determine differences in US imaging that can guide radiologists in better understanding the development of breast cancer and its prognosis.[14]

Investigators have studied many breast diagnostic approaches, including X-ray mammography, magnetic resonance imaging, ultrasound, computerized tomography, positron emission tomography and biopsy. However, these techniques have some limitations such as being expensive, time consuming and not suitable for young women.[15]

Breast density-inform legislation is increasing the need for data on outcomes of tailored screening. Dense parenchyma can mask cancers, and denser tissue is also more likely to develop breast cancer than fatty tissue. Digital mammography is standard for women with dense breasts. Supplemental screening magnetic resonance imaging should be offered to women who meet high-risk criteria. Supplemental screening ultrasonographicimaging may be appropriate in the much larger group of women with dense breasts. Both physician- and technologist-performed screening ultrasound imaging increases detection of node-negative invasive breast cancer.[16]

In our study, the ultrasound showed sensitivity: 94.1%, specificity: 89.3%, PPV: 77.4%, NPV: 97.5% and diagnostic accuracy: 90.7%. Diagnostic accuracy of

ultrasonography have been investigated in various studies. According to one study conducted by Gonzaga, sensitivity and specificity of ultrasonography was 57.1% and 62.8% in detection of breast cancer.[17] On the other hand, a study conducted by Irurhe at Nigeria concluded that sensitivity and specificity of ultrasound was 100% and 96.6% for breast lesionstaking FNAC as gold standard.[18] In a study conducted at Lahore, it was found that sensitivity and specificity of ultrasonography for breast mass was 77% and 96.2%.[19] On the other, a study conducted at Gujranwala, ultrasonography was found to be 100% sensitive and 67% specific in detecting breast diseases.[20]

CONCLUSION

Thus the ultrasound is accurate enough that it can be applied as first line diagnostic tool for differentiation of malignant breast lesions from benign lesions. Now in future, we can apply ultrasound for differentiation of malignant and benign breast lesions.

Author's Contribution:
Concept & Design of Study: Zafar Tanveer Ahmed
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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